United Nations E/CN.17/2010/7

Economic and Social Council

Distr.: General
16 February 2010

Original: English

Commission on Sustainable Development
Eighteenth session
3-14 May 2010
Item 3 of the provisional agenda*
Thematic cluster for the implementation cycle 2010-2011 (review session)

Review of implementation of Agenda 21 and the Johannesburg Plan of Implementation: Mining

Report of the Secretary-General

Summary

Minerals are essential for modern living, and mining is still the primary method of their extraction. Mining activities have in a number of cases generated few or limited benefits to producing countries in terms of economic growth and poverty reduction. In spite of progress since 2002, mining activities still generate adverse social and environmental impacts on communities living next to extraction sites and sometimes at the country level. Therefore, efforts are needed to increase the positive economic impacts of mining in producing countries and minimize the negative social and environmental impacts of mining on affected communities, with support from the international community. It is necessary to improve the basic building blocks of governance required for extractive industries to contribute to sustainable development, including: promoting transparency in revenue flows; promoting disclosure of mining projects; developing the capacity of Governments to manage volatile revenues efficiently; helping Governments develop modern policy and regulatory frameworks; integrating the public in decision-making processes at the local and national levels. In this process, a key element of local sustainable development is ensuring that the rights and interests of indigenous peoples and other local communities are recognized and respected by States and companies.

* E/CN.17/2010/1.

10-24238 (E) 100310

Please recycle

Contents

		Page
I.	Introduction	3
II.	Mining and resources at the global level	3
III.	Mining, economic development and poverty reduction	5
IV.	Environmental and social impacts of mining	9
V.	Governance in the mining sector	14
VI.	Institutional and technical capacity issues	17
VII.	Continuing challenges	18

I. Introduction

1. The present report reviews progress in the implementation of Agenda 21,[1] the Programme for the Further Implementation of Agenda 21,[2] and the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation),[3] in the thematic area of mining. The report was prepared by the Department of Economic and Social Affairs of the United Nations Secretariat and draws on inputs provided by Governments, major groups and the United Nations system, in particular the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), and the United Nations Industrial Development Organization (UNIDO), and the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development.

2. For the purpose of this report, mining is defined as the economic activity dedicated to the production of minerals and metals, including exploration, extraction and processing of the extracted minerals. Oil and gas are excluded from the scope of the report, having been considered during the fourteenth and fifteenth sessions of the Commission on Sustainable Development under the theme of "Energy".

II. Mining and resources at the global level

3. It has been estimated that between 1900 and 2005, the extraction of construction minerals grew by a factor of 34 and that of ores and industrial minerals by a factor of 27. Both factors are higher than the growth during the same period of population, which roughly quadrupled, and gross domestic product (GDP), which increased twenty-fourfold. The rate of increase in minerals extraction was higher in the second part of the twentieth century than in the first part.

4. Resource scarcity per se may not be the most binding constraint to continuing the current development model. Economic reserves for oil, gas and most metals have increased severalfold over the past decades, as a result of new discoveries and technological progress. Therefore, the time when the world is expected to run out of minerals and metals is constantly shifting to the future. The introduction of technologies allowing profitable recovery of metal from lower-grade ore is largely responsible for this increase. For example, following the introduction of the carbon-in-pulp technology, a new cyanide-milling technology, in gold extraction, economic reserves of gold worldwide quintupled within a few years' time at the beginning of the 1980s.

5. The main constraint to sustainability may instead come from the ever-increasing consumption of resources (mostly energy and water) needed to extract minerals and metals, as well as from the increasing pollution generated by the extraction process. At the end of the 1990s, mining consumed about 10 per cent of world energy, and was responsible for 13 per cent of sulphur dioxide emissions.

---

[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions adopted by the conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

[2] General Assembly resolution S-19/2, annex.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 1, annex.

6. The example of gold is illustrative. The quantity of water and energy necessary to process gold is a decreasing function of ore grade. As high-grade lodes are gradually being exhausted, the average grade of processed ores has been declining steadily. It has now declined from 5-10 grams per ton before 1980, to 1-2 grams per ton in the United States of America and Australia. Over the past few decades, resource efficiency gains in the use of energy and water in Australia, one of the leading gold mining countries, have just compensated the decline in ore grade, so that the quantity of energy and water needed to extract 1 kilogram of gold has not changed. Given that production has increased severalfold during that period, much more water and energy is used to extract gold than 20 years ago. The same trends apply to the pollution side of metals extraction. The quantity of CO_2 emitted to recover 1 gram of gold in Australia is approximately the same as it was 10 years ago. Thus, owing to the increase in gold production, CO_2 emitted by the gold mining industry has increased several times since 1980.

7. In addition, the shift from deep mining to open-cast mining that has characterized the last decades has resulted in increasing quantities of waste rocks and tailings. Nowadays, the production of 1 kilogram of gold in Australia typically creates 500 tons of tailings and three times as much of waste rocks. Tailings and waste rocks present problems of permanent acid leaching and must be treated. So far, the predominant treatment is tailing dams, which have caused numerous environmental and health issues. In summary, the combination of sustained increases in minerals extraction and changes in mining processes has resulted in ever-increasing environmental impacts.

8. On a per capita basis, the industrialized regions of Europe and North America use the lion's share of metals and minerals. In 2001, only 0.7 kilograms of aluminium were used a year in Africa per capita compared with 22.3 kilograms in the United States. Americans use about 600 kilograms of metals per person a year. During an average 70-year lifetime, Western Europeans use about 460 tons of sand and gravel, about 39 tons of steel, and 100 tons of limestone to heat houses, produce electricity, or keep cars running.

9. The demand for industrial metals extraction is determined by the demand for metals as inputs to the production process. However, the relationship between the two is mitigated by the extent of recycling that takes place. Final demand for metals in turn is determined by the final demand for products, and affected by two factors: (a) increased material efficiency, i.e., reducing the quantity of metals needed to produce one unit of product; and (b) material substitutions in the production process, where metals are replaced by other components.

10. On the other hand, the demand for gold, diamond and gemstones, the extraction of which is the main focus of small-scale and artisanal mining in many countries, is largely determined by individual consumers. Unlike most luxury commodities, the largest areas of gold consumption are found in developing countries. Given the acute environmental and social impacts of artisanal gold mining when carried out in ways that do not mitigate environmental and occupational safety and health effects, there has been a call on the part of non-governmental organizations to reconsider the necessity of mining this metal, when more supplies of gold are above than below ground. This is especially true since gold is eminently recyclable.

11. Increased recycling appears to offer great potential for further gains in material efficiency. Recycling of waste materials back into industrial production not only reduces requirements for the extraction and processing of virgin natural resources, but also saves much of the energy consumed by extraction and processing, and reduces the amount of waste going to landfills or incineration. Energy savings from the use of recycled metals are about 95 per cent for aluminium, 85 per cent for copper, 68 per cent for steel, and 60 per cent for lead and zinc. Steel production from scrap in the electric arc furnace requires about one third of the energy required for steel production from iron ore in a blast furnace, reduces air pollution by 85 per cent and water use by 40 per cent.

12. Recycling is generally more cost-effective for waste from industry and business than for household waste. However, household recycling is more cost-effective for aluminium, other metals and paper than it is for plastics and glass. In member countries of the Organization for Economic Cooperation and Development, all of which now have a variety of recycling programmes, municipal waste recycling rates for metals are increasing and now average over 80 per cent.

13. Incentives to recycle metals are affected by their prices. Increased prices for most metals during recent years have increased the incentives for recycling. However, mining subsidies, explicit or implicit, reduce the cost of mining and the economic incentives for metal recycling. Ensuring that the prices of metal reflect the full costs of mining, including externalities, would increase incentives for recycling.

14. Further increasing reuse and recycling of metals depends on addressing a number of bottlenecks. First, geographic dispersion of the waste products (as opposed to geographic concentration of mining sites and smelters) makes it a logistical challenge to provide the necessary transportation and disposal links to be able to reuse the material. However, some sites (e.g., for car dumping and metal dumping) are centralized at the municipal level, thus making it possible to devise logistical chains for reuse and recycling. Second, the design of products generally does not internalize the need for easy recovery of raw materials after the product's life has ended. This in turn can be related to the absence of life-cycle or production chain responsibility for producers. This has started to change in some countries for some lines of products (e.g., electronics, appliances) through extended producer responsibility requirements, which make industry responsible for associated waste products, including end-of-life products. These policies appear to be fairly effective in increasing recycling.

III. Mining, economic development and poverty reduction

15. At the national level, the contribution of mining to development and livelihoods and poverty reduction can be examined through the contribution of mining to the economy, in terms of direct and indirect employment, income generation opportunities, and revenues accruing to Governments. In more than 30 countries, mainly but not exclusively developing ones and countries in transition, the mining and mineral sector occupies a significant place in the national economy. Australia relies substantially on mineral commodities for export income. In Ghana, mining output constitutes about 8 per cent of GDP. In South Africa, which is responsible for more than 70 per cent of the region's mining output, the figure is

9 per cent.[4] Botswana, the Democratic Republic of the Congo, Namibia and Zambia derive over 50 per cent of their export earnings from mining. In Latin America the contribution is also important. In the Plurinational State of Bolivia, Chile and Peru, mining contributes to between 30 per cent and 50 per cent of the total value of exports.

16. ILO provides a global estimate of 25 million people involved in mining (excluding oil and gas), about half of whom are informal workers. Taking into account dependants, the ILO estimates that the number of people relying on mining, both large and small scale, for a living is likely to be about 300 million.

17. For a long time, productivity gains in the mining industry resulting from major capital investments have caused a sharp fall in employment in the mining and mineral processing sectors worldwide. However, this trend seems to have been reversed since the turn of the century, with employment in mining increasing in a sample of 67 countries covered by ILO statistics, from 10.2 million in 2003 to 11.4 million in 2007.

18. Large-scale mining, owing to its very capital-intensive nature, generates little direct employment in comparison to other industries or economic activities. Large industrial mines are heavily mechanized and the need for low-skill labour is very limited. In Mali, it was estimated that there is one job generated for each $700,000 invested in large-scale gold mines, several times less than what investments in other activities typically generate. In Ghana, in spite of large investments in the mining sector, large-scale mining corporations employed only 20,000 nationals at the turn of the century.

19. While no global estimates are available, experts agree that the number of artisanal and small-scale mining operations has increased sharply during the past few years, fuelled by sharp increases in commodity prices. For example, between 2001 and the end of 2009, international gold prices more than quadrupled, making small deposits more economical to mine.

20. While some countries have managed to create and support a strong industrial base connected to extraction of minerals and metals, in other contexts mining, similar to other extractive industries, has generated few spillovers and linkages with the other sectors of the national economy. Mining operations have often worked in isolation from the rest of the economy. Local firms, which could in principle provide services to the oil and mining companies, often do not meet the standards that those companies require. Local firms may also have insufficient capacity to deal with the process required to bid for and participate in local development projects.

21. In addition, forward linkages with the rest of the economy often do not exist because raw minerals mined in one country are processed in other countries. Finally, developing countries that have promoted downstream industries have faced tariff and non-tariff barriers to their exports. The creation of strong linkages has been a major concern in many countries such as Botswana, which have initiated so-called beneficiation programmes in an attempt to capture value from their mineral resources, e.g., by instituting local diamond and gemstone cutting.

[4] United Nations Statistics Division, 2009.

22. At a macroeconomic level therefore, the positive impacts of mining on economic development importantly depend on the portion of the resource rents that goes back to Governments, and on the way revenues generated by mining and accruing to Governments are spent. With regard to the former, during the 1990s many countries revised their legal and regulatory framework applying to mining with the hope of attracting foreign direct investment in the sector. In the African context, the revised mining codes often offered low royalties, tax exemptions, exemption of import and export duties, and repatriation of profits. It has been argued by some observers that the balance has tilted too far in the direction of private companies. In other regions, the tendency has been towards a renationalization of mineral resource sectors.

23. Given the importance of revenues from mining in many developing countries and their non-renewable character, their efficient use for development is crucial. However, in many cases these revenues have not contributed as much as expected to sustainable development. The Extractive Industries Review undertaken for the World Bank, which has become a reference point for many stakeholders in the mining sector, concluded that attracting foreign direct investment in the mining sector was not per se a sufficient condition for poverty reduction. In order for poverty reduction to take place, numerous preconditions have to be in place before resource extraction starts. The final report of the Extractive Industries Review highlighted three main preconditions: (a) pro-poor public and corporate governance; (b) much more effective social and environmental policies; and (c) respect for human rights.

24. Artisanal and small-scale mining, understood as encompassing small and medium mining enterprises that use sometimes rudimentary techniques to extract mineral substances, is often present in countries with valuable deposits of gold, diamonds and precious gemstones, where it often coexists with large-scale mining practised by large companies, often multinational corporations. Although recent and precise figures for the populations engaged in artisanal and small-scale mining activities worldwide are not available, by some accounts the number of people depending on this type of activities has grown since the last global numbers were published by ILO in 1999. At that time, it was estimated that 13 million people were engaged in artisanal and small-scale mining. In China in 2006, artisanal and small-scale mining was estimated to employ more than 5 million people, representing 53 per cent of those employed in the mining industry, while generating 41 per cent of total production value.

25. Artisanal and small-scale mining is thought to have developed rapidly in Africa in the 1990s, partly as a consequence of Structural Adjustment Programmes that have retrenched thousands of former civil servants, as well as reforms undertaken by many countries to attract foreign investment in the mining sector, which have resulted in massive land transfers to private companies in the form of concessions. According to the Ghana Chamber of Mines statistics, 13 per cent of the land area of Ghana is currently under concession to mining companies, representing an estimated 40 per cent of gold-mineralized land in the country. In some countries the importance of those land transfers is thought to have severely limited local possibilities for livelihoods based on the exploitation of land, including agriculture.

26. It is widely recognized that the development of artisanal and small-scale mining is largely a product of poverty and lack of viable alternative livelihoods. In

Mozambique, artisanal miners typically report earnings in the range of $140-160 a month, which is four times as much as subsistence farmers in the neighbouring provinces earn from cash crops.[5] In Suriname, studies suggest that small-scale mining acts as an alternative economic occupation when the national economy is experiencing stress, for example in the form of hyperinflation, or when specific groups are excluded from alternative occupations. In reality, the choice facing many miners may not simply be between mining and some other activity (typically farming), since mining may be a secondary occupation used to raise money for investment in farming.

27. A large part of the artisanal and small-scale mining sector operates at the fringe of or outside legality, ignoring factors such as existing property rights (that commonly vest all mineral rights in the State), work safety and environmental regulations, and taxation systems. In some countries, this has deprived Governments of sources of foreign exchange and facilitated the entrenchment of parallel trade networks. It is estimated that in Mozambique, only 10 to 15 per cent of the gold produced by artisanal miners is bought by the Government. In Madagascar, almost all of the $400 million worth of gemstones mined each year is exported illegally. In some contexts the rents that do not accrue to the State have financed networks engaging in more or less open promotion of civil warfare, as in the case of diamonds and other rare, easily portable and highly valuable minerals from certain parts of Africa.

28. Many countries have tried to formalize artisanal and small-scale mining activities by integrating them into the formal economy. However, policies in that direction have so far met with little success, and populations involved in artisanal and small-scale mining activities have continued to grow in many countries. In addition to the geographic dispersion and mobility of the artisanal and small-scale mining activities, which make them inherently difficult to control, failure of many formalization programmes has been attributed to the following shortcomings: insufficient knowledge of the populations involved in artisanal and small-scale mining and their dynamics; absence of credible and viable alternative livelihoods, especially in many donor-funded projects that have sought to promote alternative livelihoods to such mining; insufficient economic incentives for miners to formalize, given high monetary and non-monetary costs of the administrative processes involved, and the low probability of getting licence requests accepted; and the disconnect between legally permitted areas for small-scale extraction and the geographic distribution of mineral deposits. Also, in some countries government support is provided only to legal mining communities, leaving a large portion of the mining population outside the scope of capacity-building and awareness-raising programmes. As a result, small-scale miners have little or no incentive to move to designated areas and instead tend to remain in unauthorized settlements. This is reinforced by a context in which artisanal and small-scale mining is only gradually being addressed within national poverty reduction policies, and is segregated from district-level planning.

29. Studies in contexts as different as China and the United Republic of Tanzania have concluded that the contributions of artisanal and small-scale mining to

[5] S. Dondeyne, E. Ndunguru, P. Rafael and J. Bannerman, "Artisanal mining in central Mozambique: Policy and environmental issues of concern" (2009), *Resources Policy*, vol. 34 (1-2), pp. 45-50.

livelihoods and poverty reduction outweigh its negative impacts, but that Governments need to exert a greater effort to regulate, guide and encourage the development of artisanal and small-scale mining and to create a sound environment for its operations. The studies generally conclude that marked environmental and socio-economic improvements could be achieved within artisanal mines if the Government provided institutional and technical support to local operators and improved laws and regulations applying to the small-scale mining sector.

IV. Environmental and social impacts of mining

A. Environmental impacts

30. The environmental impacts associated with mining activities, which vary from region to region depending on mining and disposal technologies and local features, include the nature of the ore/mineral; the depth of the deposit; the chemical composition of the extracted matter and the surrounding rocks; naturally occurring substances; topography; climate; and reclamation practices.

31. For surface mines, the main environmental problems are large-scale land use, overburden removal and disposal, soil loss and erosion, disturbance of hydrology, siltation of rivers and pollution of water sources, acid mine drainage, fugitive dust, and reclamation. For underground mines these problems are: mine water drainage; methane emissions; and fugitive dust. Other environmental effects of mining activities include transport of hazardous materials, deterioration of air and water quality, noise, vibrations, and visual impacts. If not managed well, many of these can adversely affect the health and livelihood of the poor and vulnerable groups living near mining operations and sometimes at significant distances from extraction sites.

32. The large quantities of toxic waste that can remain from mining operations must be carefully managed in order to avoid water pollution through leaching and to prevent failure of structures and dams built to contain the waste. Mining operations break up the terrain and hence increase the surface area exposed to rainfall. Although waste-rock contains low concentration of toxic elements, the clays and silts eroded can cause streams to become burdened with suspended solids. Run-off harms can be more severe where sulphide deposits are being worked or where high-sulphur coal is being extracted. Drainage of acid water from mine sites is a serious problem in areas with significant rainfall. Surface water infiltrates the rock debris left after mining, where it reacts with sulphide materials to produce sulphuric acid, polluting streams and groundwater resources.

33. The disposal of tailings from mining has been a pervasive cause of environmental damage. Riverine tailings disposal has been criticized as destroying ecosystems and polluting water sources. The effects of submarine tailings disposal are not well known but there are fears that it can have harmful effects on marine ecosystems and adversely impact the livelihoods of communities depending on those ecosystems, such as coral reefs that have important ecological functions or cultural significance or coastal waters used for subsistence purposes. This mode of waste disposal is used mainly in a number of developing countries, and it is effectively banned under the Clean Water Act in the United States of America.

34. A legacy of abandoned mine sites and quarries bears witness to the unsatisfactory environmental performance of the industry in the past. These abandoned sites spoil the landscape and can pose severe environmental threats owing especially to acid mine drainage. The legal responsibility for environmental restoration of these sites is often unclear, because of deficiencies in the legal framework or difficulty in identifying the responsible parties. In the United States of America today, a company opening a new mine is required by law to buy a bond by which a separate bond holding company pledges to pay for the mine's clean-up cost in case the mining company itself goes bankrupt. But for many mines, the eventual clean-up costs have proved to exceed the value of the bond. Older mines were not required to buy such bonds at all.

35. The lack of guarantees for clean-up costs often leaves those costs to the public. In the United States of America, although uncommon, environmental expense can exceed hundreds of millions of dollars per development. The cost of cleaning up some 550,000 abandoned hard rock mining sites in the United States is estimated by the Environmental Protection Agency to be in the range of $32 billion to $72 billion.

36. Reclamation and restoration of the land after mine closure has been a significant challenge that has not been satisfactorily addressed in many countries. For example, the Economic Commission for Europe notes that, in parts of South Eastern Europe, "poor or negligible implementation of mine rehabilitation and closure activities has resulted in, and continues to cause, significant adverse environmental and health and safety impacts and related liabilities".[6]

37. Small-scale gold mining uses mercury for amalgamation, sometimes in combination with cyanide. Mercury is used by small-scale gold miners in more than 50 developing countries, where significant releases of mercury are associated with inefficient amalgamation techniques. Mercury releases from artisanal mining are estimated to account for more than half of total mercury releases and are estimated to range from 800 to 1,000 tons per annum. Unmonitored releases of mercury from gold amalgamation have caused considerable environmental contamination and human health complications in rural reaches of sub-Saharan Africa, Latin America and Asia. Amalgamation followed by cyanidation poses additional environmental and health consequences, as mercury-contaminated tailings may interact with cyanide in ways that increase the bioavailability of mercury in the environment.

38. In recent years, strategies to tackle mercury pollution from artisanal gold mining have mainly included restrictions — banning mercury trade internationally, prescribing alternative technologies and tightening regulations on mining (e.g., banning mercury use). However, artisanal miners often find it difficult to improve technologies and reduce mercury pollution. Research has advanced the hypothesis that pollution abatement strategies fail if they do not explicitly address local socio-economic capacities for improving environmental management.

39. Mercury use has been one of the main targets of interventions by United Nations agencies, international financial institutions, and donors, including the UNIDO-led Global Mercury Project. Interventions have focused on limiting the adverse environmental and health impacts of mercury release by small-scale mining operations. Improved intervention strategies have now been developed to overcome

[6] See note by the ECE secretariat (ECE/AC.25/2009/3, para. 82), prepared for the Fourth Regional Implementation Meeting on Sustainable Development.

the challenges identified by previous generations of projects, which included: lack of adaptation of technical solutions to local values or materials, as well as high costs of proposed techniques; implementation of technical facilities (such as centralized mercury mills for gold amalgamation) without proper consideration of local demand and local dynamics of the mining communities; and dilution of the effect of awareness-raising campaigns due to rapid changes in mining populations.

40. Overall, much uncertainty remains in identifying when and where the potential environmental and social costs of mining are too high. Non-governmental organizations and companies have developed general principles and criteria for identifying areas that should be off-limits to mining, oil and gas development. Attempts have also been made to identify what might constitute "vulnerable ecosystems". Although global and national policy debates often centre on "no go" areas on land that is already subject to legal protection, mining in important ecosystems that are not adequately protected may pose an even greater threat. Global analysis undertaken by the World Resources Institute showed that more than one quarter of the world's active mines and exploration sites overlap with or are within a 10-kilometre radius of a strictly protected area; nearly one third of all active mines and exploration sites are located within areas of intact ecosystems of high conservation value; almost one third of all active mines are located in stressed watersheds; nearly one fifth of active mines and exploration sites are in areas of high or very high seismic hazard; and more than one third are in areas that may be predisposed to water quality problems.

B. Social impacts

41. The mining industry can have important impacts on social development, some positive but many negative. One pervasive problem is that capital-intensive mining operations generate limited local employment opportunities. Yet, their claims on mineral resources — sanctioned by concession agreements with national Governments — frequently bring them into conflict, at times violent, with local communities over land, water and other natural resources on which those communities depend for their livelihoods. Absence of (or merely pro forma) consultation with local and indigenous communities on decisions to start and operate mining activities has remained a pervasive issue.

42. According to the provisions of the United Nations Declaration on the Rights of Indigenous Peoples, extractive industries must not operate on indigenous lands or territories without obtaining the free, prior and informed consent of the relevant communities and indigenous peoples. This includes the right to refuse extraction or exploration. Free, prior and informed consent is conceived as a right and not an obligation and it is therefore up to the indigenous peoples to determine whether they will engage in discussions or not, as discussed in the 2009 report of the international expert group meeting on extractive industries, indigenous peoples' rights and corporate social responsibilities. These rights are widely recognized and were recently reinforced by the Inter-American Court of Human Rights, which noted that members of tribal and indigenous communities have the right to own the natural resources they have traditionally used. Without them, the very physical and cultural survival of such peoples is at stake. When large-scale development or investment projects could affect the integrity of such peoples' lands and natural resources, the State has a duty to obtain their free, prior and informed consent.

43. In many places there remain basic ambiguities regarding the legal basis for resource and tenure rights. Indigenous peoples in particular have suffered from lack of recognition of their rights over land and resources, as well as from lack of enforcement of such rights when they exist. Resettlement of local population following the granting of concessions to mining companies has often been decided without prior information or consultation of the populations involved, and has not been adequately compensated, especially in cases where traditional subsistence patterns were radically affected by mining developments. This has often led to direct conflicts and militarization of mining areas.

44. Conflicts between small-scale miners and large-scale mining companies have occurred over land ownership and use rights. Attempts by Governments to enforce companies' rights in concession areas have often resulted in evictions and resettlement of artisanal miners. In that respect, in some countries large mining companies have been criticized for not allowing small-scale miners to use the parts of mineral-bearing land in their concessions that were not economically profitable for large-scale mining. The absence of legal instruments allowing for transfers of land rights has been mentioned as an obstacle to improvements in that regard. Conflicts have also occurred with authorities when communities perceive they are denied the right to exploit mineral resources that they consider theirs, including in protected areas.

45. Working conditions and related health issues in the mining sector have been a cause of concern. A large number of children work in artisanal and small-scale mining. In Papua New Guinea, for example, children provide up to 30 per cent of the small-scale mining workforce. According to ILO, although it only accounts for 0.4 per cent of the global workforce, mining is responsible for over 3 per cent of fatal accidents at work. Especially where regulation is lax, mineworkers face serious safety and health problems — such as exposure to dust, mercury and other chemicals, as well as poor ventilation, inadequate space and overexertion. The risks of death or fatal injuries caused by explosions, falling rocks or poor equipment are very high. Silicosis and mercury poisoning are occupational hazards of small-scale mining that also extend to people living in the surrounding community. In some cases symptoms take many years to manifest themselves, as in the case of asbestos-related diseases. Asbestos is now banned in a large number of countries.

46. To date, 23 countries have ratified the 1995 ILO Convention No. C176 on Safety and Health in Mines. Given that this Convention provides a framework to achieve continuous and sustainable occupational safety and health improvements, its ratification could dramatically improve laws and regulations in those countries where mine safety is weak and where no coherent occupational safety and health policy exists for the sector. Improving working conditions in the artisanal and small-scale mining sector will remain a challenge as it operates largely outside the law with minimum work safety and health standards.

47. Women provide up to 50 per cent of the small-scale mining workforce, but their compensation typically lags behind that of male mine workers. In some countries, mining has been a driver of labour migration, with miners living in single-sex hostels far from their families. In South Africa, this has played a significant part in the rise of the HIV/AIDS epidemic, with infected miners bringing the disease back with them to the rural areas. Increased vulnerability of women in informal mining communities, high prevalence of HIV/AIDS, and exposure of

pregnant women to mercury vapours are serious issues. Studies suggest a growing need for policies to address female employment in artisanal and small-scale mining and, more generally, rural employment.

48. Social Impact Assessments are often mandated by laws and regulations for all proposed mining projects. While the goal of Social Impact Assessments is to identify and address potential social issues proactively, a number of weaknesses of this and related instruments have been identified. They include insufficient scope; lack of a comprehensive approach addressing all relevant issues; lack of integration of social, environmental and economic issues; an overly technocratic approach; and the static nature of these exercises. Generally speaking, the social side has been dubbed the "weakest pillar" of sustainability assessment. The demand for greater integration of social and environmental impact assessments is supported by the Extractive Industries Review.

C. Responses by the mining industry

49. In response to the environmental and social issues highlighted above, the mining sector has put in place tools for improved resource efficiency and pollution minimization, as well as tools to minimize adverse impacts of mining activities on the surrounding communities and natural environment. Many companies have also stepped up their engagement in corporate social and environmental responsibility activities.

50. Large mining companies have increasingly adopted voluntary initiatives, both external and emanating from the mining industry itself. Those include voluntary programmes such as industry codes (e.g. ISO 14000 standards); adherence to the Global Reporting Initiative and Global Reporting Initiative Mining and Metals Sector Supplement reporting requirements; and adherence to principles promoted by industry associations, UNEP, ILO and others, such as the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy and the sustainability principles of the International Council on Mining and Metals, in conjunction with the "Enduring Value" implementation guidance. They also include more specific guidelines covering technical aspects of the mining process, such as international guidelines on the use of cyanide and other toxic chemicals.

51. Cleaner production technologies have been increasingly used by mining companies, as they have a direct impact on their financial bottom line. Preventive environmental management practices such as waste minimization and eco-efficiency, and analytical tools such as Life Cycle Assessment and Industrial Ecology, have been customized by the minerals-processing industry for process designs, input substitutions, in particular for toxic chemicals, plant improvements, continuous improvement in operation and maintenance practice and systems, and reuse, recovery and recycling of process waste streams.

52. Current pollution minimization practices and policies adopted at the operations of the major mining companies include environmental management systems, advanced pollution control technologies, environmental awareness training for employees, and increased accountability for environmental impacts as required by company stakeholders. In Australia's mining and mineral-processing industries, a recent study found that improvements had been made and policies aiming at pollution minimization implemented over the previous few years.

53. Recent years have seen an increase in the importance that large mining companies give to enhancing their voluntary corporate social and environmental responsibility initiatives, which have become more integrated with the mining companies' bottom lines. Mining companies have also stepped up their engagement in social issues arising in mining or neighbouring communities, beyond the customary health and education programmes. The enlarged scope of concern of mining companies now encompasses informal settlements, HIV/AIDS issues, and crime, all seen as factors directly affecting worker productivity and the reputation of the firm.

54. This shift has been related both to market pressures from institutional investors and stock exchange regulations on corporate governance in the case of listed firms, and to stepped-up government demands regarding the contribution of mining firms to social and economic development. For example, in South Africa, the Black Economic Empowerment scorecard, introduced by the Government as a tool to measure performance and provide a basis for renewing mining licences, has been mentioned by all stakeholders as instrumental in promoting more ambitious and better integrated corporate social and environmental responsibility activities. As a result, the trend has been to increased transparency on environmental and social performance of large companies.

55. While corporate social and environmental responsibility initiatives generally represent progress, some concerns have been flagged. Lack of coordination of corporate social and environmental responsibility strategies with other development partners (State, municipalities, non-governmental organizations) has been mentioned. Another concern is that, in some countries, those initiatives may act as a substitute for rather than complement to government investment in infrastructure and social services in the producing regions. The amounts invested by companies through those initiatives are generally small by comparison with the revenues from mining accruing to the central Government. While a share of such revenues should normally return to the producing regions, disagreements are commonplace regarding what constitutes a fair share. Broad publicity of corporate social and environmental responsibility initiatives by mining firms has sometimes been criticized as masking the companies' unwillingness to engage meaningfully with local communities, recognize their obligations to keep the environment clean, or at least compensate fairly those directly affected by their activities.

V. Governance in the mining sector

A. International governance

56. Control over natural resources is governed according to the principle of national sovereignty. As stated by Principle 21 of the Stockholm Declaration, "States have ... the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction".[7] National sovereignty over

[7] *Report of the United Nations Conference on the Human Environment, 5-16 June 1972* (United Nations publication, Sales No. 73.II.A.14 and corrigendum), chap. I.

the use of natural resources was reaffirmed in 1992 in the Rio Declaration of the United Nations Conference on Environment and Development.[8]

57. The Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development, an outcome of the World Summit on Sustainable Development, currently serves as the only global intergovernmental policy forum in the mining and minerals sector. The Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development is a voluntary initiative officially established in 2005 by national Governments interested in promoting good governance in the management of mineral resources.

58. Since 2002, major international multi-stakeholder initiatives have been launched, targeting more transparency over the revenues generated by mining activities by both companies and Governments. These include the creation of the Kimberley Process Certification Scheme, which imposes stringent requirements on trade to ensure that so-called "conflict diamonds" are not traded; the Publish What You Pay Campaign, an international campaign led by a coalition of non-governmental organizations calling for the mandatory disclosure of tax, fee and royalty payments made by companies to Governments for the extraction of minerals; and the Extractive Industries Transparency Initiative.

59. The Extractive Industries Transparency Initiative supports improved governance in resource-rich countries through the verification and full publication of company payments and government revenues from oil, gas and mining. The Initiative works to build multi-stakeholder partnerships in developing countries in order to increase the accountability of Governments. Some 20 countries have either committed to, or are now actively implementing the Extractive Industries Transparency Initiative in Africa, Asia, Europe and Latin America. The World Bank has also taken a strong position in support of the Extractive Industries Transparency Initiative, stating that transparency is the key to development in resource-rich countries. However, transparency is not a core condition for lending.

60. Many experts on the mining sector have mentioned that the Extractive Industries Transparency Initiative, while going in the right direction, does not fully address transparency issues linked with the mining industry. Firstly, the Initiative does not require but "encourages" Governments and companies voluntarily to develop a framework to promote transparency of payments and revenues. Secondly, it does not address the questions of allocation and use of the revenues from mining once they reach government coffers.

61. In addition, various initiatives from mostly non-governmental stakeholders have tried to promote certification schemes that would address environmental and social issues associated with the mining of gold and precious stones. The objective would be to reward miners using clean production methods (i.e., without using mercury or harmful chemicals such as cyanide) by allowing them to obtain a higher market price through certification. Inexpensive but reliable methods to distinguish environment-friendly recovered gold apparently exist. The Association for Responsible Mining, in conjunction with the Fairtrade Labelling Organizations, has created a set of principles known as Standard Zero to define fair trade gold. They are in the initial phases of testing these standards in Latin America.

---

[8] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I.

B. National governance

62. The so-called resource curse, or paradox of plenty, holds that countries that are heavily dependent on the extractive industries perform less well economically than other countries, all else being equal. The evidence behind the resource curse hypothesis is still a matter of debate, however. Exceptions to the resource curse include, for example, Botswana and Chile, which are frequently cited as countries that have managed the revenues generated by extractive industries well. However, many countries have had, or currently have, difficulties managing the revenues produced by their extractive sectors.

63. In a number of countries, internal and external conflicts or episodes of civic unrest can be related to control of mineral resources. In many cases, the issues at stake involve the control of the revenues generated by mineral resources, and especially the part of those revenues that benefits the producing regions. In other contexts, the debate is over the transparency of the revenues received by Governments from mining companies, and the degree to which their allocation and use is subject to public scrutiny. Tensions can also arise in stable countries over the issues of adequate compensation of host communities for environmental damage and loss of livelihoods caused by mining activities.

64. Several countries receiving a massive inflow of revenues from natural resources have experienced to varying extents a decline and loss of competitiveness in their manufacturing sectors or have failed to diversify their economies beyond the extractive sectors. This effect, the so-called Dutch disease, has been explained by increases in exchange rates caused by the influx of resources in economies with limited absorptive capacities. This has left some developing countries vulnerable to high price volatility of minerals as compared to manufactures as well as prolonged downturns in mineral prices.

65. Risks of Dutch disease are now well understood and a number of countries have taken measures to prevent it. Investments in education and infrastructure are a long-term way to increase the competitiveness of the manufacturing sector, thereby mitigating the effects of Dutch disease. Another way of preventing Dutch disease is to isolate the revenues from mining, or the windfall part of them, from the rest of the economy. In some countries such as Peru, Chile, Ghana and Botswana, the totality or a portion of the revenues from minerals is set aside in a special fund, whose uses are defined by law. Some countries have explicitly recognized the need to set aside some part of the revenues for future generations. Others have used funds for macroeconomic stabilization purposes, accumulating excess revenues when prices are high in order to channel revenues into the budget when prices are low, thereby smoothing out government expenditure. Yet others have recognized the inflationary and other macroeconomic risks caused by the accumulation of revenues in national economies with limited absorptive capacities, and use at least part of the fund proceeds only for investment abroad.

66. In some countries, revenues from extractive industries are said to heighten corruption. Exclusive reliance on revenues from minerals extraction also potentially weakens the accountability link that exists between the Government and the people through taxes.

67. Lack of transparency regarding the revenues received by Governments from mining companies has been an obstacle to efficient use of these revenues for

sustainable development. Several factors have contributed to this situation. One is the lack of transparency and disclosure of exploitation contracts signed between Governments and companies. The proliferation of project-specific investment agreements, in contrast with a general framework for sharing of revenues between companies and the Government, reinforces the opacity of the revenues for the public. Another factor is the mere complexity of the tax regime applying to mining companies. For example, in Mali, companies mining gold are subject to 27 different taxes.

68. The Extractive Industries Transparency Initiative and the Publish What You Pay campaign have contributed to improving the situation, by allowing figures on the amounts paid by companies to Governments to be made public and thereby generating debate within countries over transparency and accountability issues. However, analyses of the implementation challenges of the Extractive Industries Transparency Initiative and the Kimberley Process Certification Scheme in Sierra Leone have highlighted the fact that the introduction of complex monitoring processes associated with these schemes may represent a significant challenge for countries emerging from conflicts and isolation, suffering from serious shortages in human capacity, and where good governance, accountability and transparency will take time to develop. The existence in many countries of entrenched illegal networks for trading diamonds and gold, often acquired from artisanal and small-scale operators operating outside the formal law, adds a degree of complexity to the introduction of processes such as the Extractive Industries Transparency Initiative and the Kimberley Process Certification Scheme.

69. Transparency over the allocation and use of revenues is even more difficult to achieve. There is often a lack of communication mechanisms between institutions involved in revenue management. Lack of information on budgets at all levels of society is a major limiting factor, which often generates uncertainties at the local level over how much revenue should be received from the Government. Simple actions which have been proven to make a difference in terms of transparency include: supporting local radio stations in vernacular languages, both as a means to reinforce the voice of local communities (by providing channels for conveying priorities and needs) and for education purposes (sharing budget information); promoting better dissemination of budget information; and promoting communication between institutions (e.g., by support for printing budget sheets and distributing them).

VI. Institutional and technical capacity issues

70. Adequate capacities at the national and subnational government levels for planning, dealing with companies, representing the interests of all parties, enforcing regulations relating to health, working safety and the environment have been found to be lacking in many countries. While regulatory trends are moving towards the decentralization of powers and functions to lower levels of government, in general local governments often lack sufficient financial and human resources to effectively monitor compliance and drive mining activities towards more sustainable practices. Lack of qualified personnel for the enforcement of health and work safety regulations, as well as environmental regulations, is a serious issue in many countries.

71. Inconsistency between national development plans and actual investments is a general concern that goes beyond mining sector issues. Lack of capacity of both central governments and local governments to design and implement development projects is a serious hurdle. The inability of certain sectors to spend quickly has sometimes been used as a justification for shifting funds from priority sectors to others with higher capacity to disburse quickly, such as construction or roads. This bias can result in inefficient projects. At the same time, projects with a significant impact on long-term development, e.g., in health or education, which are generally identified as priorities in national development plans, often receive lower priority in budget allocations. Lack of information-sharing and cooperation between sectors and levels of government can reinforce these inconsistencies.

VII. Continuing challenges

72. Addressing the sustainability issues highlighted in the present report requires a broad perspective. Mining activities have in a number of cases generated few or limited benefits to producing countries in terms of economic growth and poverty reduction. In the meantime, the process of mining itself generates adverse social and environmental impacts on communities living next to extraction sites and sometimes at the country level. Environmental and other social costs associated with the production and use of mineral resources have been rising with the increase in extraction globally.

73. Simultaneous efforts to decouple economic growth from mineral extraction, increase the positive economic impacts of mining in producing countries, and minimize the negative social and environmental impacts on affected communities are needed and have to rely on aggressive government actions in four broad directions.

74. One such direction is to increase the share of recycling of metals. Apart from removing implicit and explicit subsidies to mining, which negatively affect the incentives for recycling metals, increasing reuse and recycling of metals depends on addressing a number of bottlenecks, a few of which have been highlighted in this report.

75. A second direction is to improve the basic building blocks of governance required for extractive industries to contribute effectively to sustainable development, including: promoting transparency in revenue flows; promoting disclosure of mining projects; developing the capacity of Governments to manage fluctuating revenues; helping Governments develop modern policy and regulatory frameworks; and integrating the public in decision-making processes at the local and national levels. In this process, a key element of local sustainable development is ensuring that the rights and interests of indigenous peoples and other local communities are recognized and respected by States and companies.

76. A third direction is to help Governments in producing countries make the most of their mineral resources by ensuring productive investment and other uses of mining revenues, and creating stronger forward linkages between mining and the rest of their economies, allowing for the creation of dynamic industrial sectors.

77. At the same time, increased efforts must be made by Governments, with support from the international community, to minimize the negative social and

environmental impacts of mining. Although it has progressed since the World Summit on Sustainable Development, the integration of sustainability into legal frameworks for mining is still in the formative stages. Much more needs to be done in order to shift the emphasis from restoration to prevention. There is an urgent need for action in order to integrate environmental and social management systems in the full mining life cycle and to enhance the use and reach of integrated environmental and social impact assessments. Capacity-building is needed at many levels to allow Governments to reap the benefits of mining activities while avoiding or limiting their adverse impacts.